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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/082,338	02/26/2002	Masahiro Aoki	ASAM-0042	6426

7590 04/08/2004

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EXAMINER	
LEUNG, QUYEN PHAN	
ART UNIT	**PAPER NUMBER**
2828	

DATE MAILED: 04/08/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

Office Action Summary	Application No.	Applicant(s)	
	10/082,338	AOKI, MASAHIRO	
	Examiner	Art Unit	
	Quyen P. Leung	2828	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *29 December 2003 and 15 January 2004*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-7,9-17,19 and 20* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,9-17,19 and 20* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application (PTO-152)
6) ☐ Other: _____.

DETAILED ACTION

Response to Amendment

1. In response to applicant's amendment filed 12/29/2003 and 1/15/2004, claims 1-5, 7, 9-15, 17, 19-20 have been amended and claims 8 and 18 canceled. Claims 1-7, 9-17 and 19-20 are pending.

Response to Arguments

2. Applicant's arguments with respect to claims 1-7, 9-17 and 19-20 have been considered but are moot in view of the new ground(s) of rejection.

Claim Rejections - 35 USC § 102

3. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

4. Claims 1-5, 11-15 are rejected under 35 U.S.C. 102(b) as being anticipated by Hirata et al (5,953,357). Hirata et al discloses the claimed invention. Figures 1 and 2 illustrate a semiconductor laser comprising a substrate (1), a core region (3) defined by an active layer (3); a clad region defined by at least one clad layer (4) overlaying the active layer (3), wherein the core region (3) has a gain region (L_2) with a length (see col.

5 lines 11-12 for a length of 200 um) not smaller than 18 micrometers and not greater than 200 micrometers along an optical axis of at least the core region or the clad region; at least one of the core region or the clad region has a stripe shape with a width modulated in a direction perpendicular to the optical axis such that the width is narrower in the vicinity of ends of the gain region than a center portion thereof.

Fig. 1

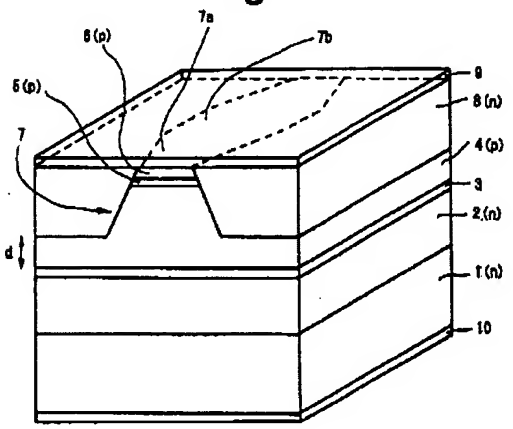
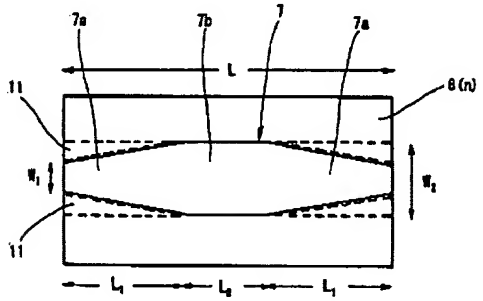


Fig. 2



bottom of the ridge stripe portion 7 at cavity-lengthwise end surfaces and cavity-lengthwise central portion. Width W_1 of the ridge stripe portion 7 at cavity-lengthwise opposite end surfaces and width W_2 of the cavity-lengthwise central portion are determined to satisfy $W_1<W_2$, $W_1 \leqq 5$ μm and $W_2 \leqq 7$ μm.

An example of laser structure parameters of the buried-ridge semiconductor laser is: cavity length L=400 μm, length L_1 of each tapered region *7a* of the ridge stripe portion 7=100 μm, length L_2 of the straight region *7b* of the ridge stripe portion 7=200 μm, width W_1 of the ridge stripe portion 7 at each cavity-lengthwise end surface =4 μm, and width W_2 of the cavity-lengthwise central portion of the ridge stripe portion 7=6 μm.

In the buried-ridge semiconductor laser having the above construction, the transverse mode can be stabilized when the width W_1 of the ridge stripe portion 7 at each cavity-lengthwise end is not larger than approximately 5 μm (in this case, 4 μm).

It is inherent that Hirata's sections having length L_1 are the claimed lateral mono mode waveguide, because Hirata teaches the width W_1 being less than 5 microns.

5. Claims 1-7, 9-17 and 19-20 are rejected under 35 U.S.C. 102(e) as being anticipated by Furushima (6,219,366). Furushima discloses the claimed invention.

Note col. 1 lines 1-25 for an optical fiber, and figures 13a-13d for a semiconductor optical device (see col. 1 lines 10-18 where the semiconductor optical device being a semiconductor laser is taught) comprising a substrate (1a), a core region defined by an active layer (9), a clad region (12) overlaying the active layer (9), where in the core region has a gain region (17) with a length (see col. 12 lines 58 for the length of 190 um) not smaller than 18 um and not greater than 200 um along the optical axis of at least the core region or the clad region, at least one of the core region and the clad region has a stripe shape with a width modulated in a direction perpendicular to the optical axis such that the width is narrower in the vicinity of ends of the gain region than a center portion thereof.

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SEMICONDUCTOR OPTICAL DEVICE AND METHOD OF MANUFACTURING THE SAME

BACKGROUND OF THE INVENTION

This invention relates to a semiconductor optical device which are applicable for an optical communication, an optical disk device and an optical interconnection and the like and a manufacturing method thereof, and in particular, to the semiconductor optical device which has a spot-size conversion function and a manufacturing method thereof.

In a semiconductor optical device, such as, a semiconductor laser, a semiconductor optical amplifier and a semiconductor optical modulator, a spot diameter of an optical beam which is emitted from an optical waveguide is small and further, a beam divergence is large. Consequently, it is generally difficult to couple the semiconductor optical device to an optical fiber or a silica-based optical waveguide.

To this end, the semiconductor optical device is conventionally coupled to the optical fiber or the optical waveguide by the use of an optical module with a lens. However, the lens if generally expensive, and further, the position of semiconductor optical device must be adjusted with parts, such as the lens, the optical fiber and the optical waveguide at a high accuracy. This remarkably increases the price of the optical module.

From col. 12:

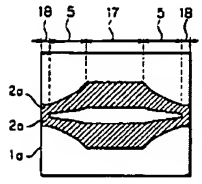

FIG. 13A

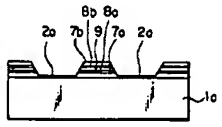

FIG. 13B

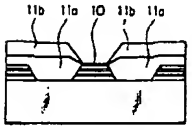

FIG. 13C

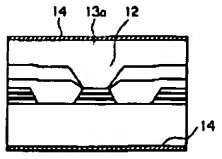

FIG. 13D

Referring to FIGS. 13A through 3D, description will be made about a semiconductor optical device according to a third example of this invention. Herein, the third example corresponds to the second emobdiment illustrated in FIG. 4.

As shown in FIG. 13A, a SiO_2 film having the layer thickness of 0.1 μm is deposited by the use of the on an n-InP substrate 1*a* and is patterned by the use of the photolithography method and the dry-etching method to form a SiO_2 mask 2*a*. The mask width Wm and the opening width Wo of the mask 2*a* are set to 50.0 μm and 2.0 μm in the lenear gain waveguide portion **17** having the length of 190 μm, respectively. Further, the mask width Wm and the opening width Wo gradually become smaller in the taper portions **5** having the length of 130 μm, and are set to 1.0 μm and 0.6 μm in the portions which contact with the window structure portions **18** having the length of 10 μm, respectively.

On the n-InP substrate 1*a* having such a SiO_2 mask 2*a*, an n-InP clad layer 7*a* (the thickness of 0.2 μm, the doping concentration of 1×10^{18} cm^{-3}), an n-type InGaAsP-SCH

Regarding the Bragg reflector, see col. 14 lines 32-55:

Although the preferred embodiments has been described as mentioned before, this invention is not limited to above embodiments.

For instance, although the Fabry-perot type resonator and the DFB laser are exemplified as the laser, the DBR laser may be used. Further, the oscillation wavelength is equal to 1.3 μm in the above embodiments. Alternatively, any wavelength band including, for example, a visible wavelength band, such as 1.55 μm, 1.65 μm, 0.98 μm and 0.68 μm, may be used.

Moreover, although the MQW structure having the compressive strained quantum well layer is used in the above embodiments, the MQW structure having an distortion, a distortion compensation type MQW structure and a bulk active layer may be used. Further, AlGaInAs/InP system, AlGaAs/GaAs system, AlGaInP/GaInP system may be used as the materials other than the InGaAsP/InP system in the above-mentioned embodiments.

Further, a buried structure having, for example, a semi-insulating Fe doped InP may be used instead of the pnpn type current block structure of the homo-embedding structure of the P-InP. Moreover, the conductivity type of the substrate is not limited to the n-type in the above emobdiment, and may be a p-type.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Quyen P. Leung whose telephone number is (571)272-1943. The examiner can normally be reached on 9-5:30, M-F.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Don Wong can be reached on (571)272-1834. The fax phone number for the organization where this application or proceeding is assigned is 703-872-9306.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should

you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free).

Quyen P. Leung
Primary Examiner
Art Unit 2828

QPL